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Gum arabic, carrageenan of various types and sago palm starch as binders in prawn diets

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Sago palm starch, gum arabic and three types of carrageenan EPT-2, St-0008-29 and St-0008-30A were tried as binders in a practical diet (Table 1). Five gms sago palm starch was gelatinized in 20 cc water before it was added to the dry ingredients. Five gms gum arabic was dissolved in 360 ml water at a temperature of 80°C and boiled. The same was done with the three types of carrageenan. Before incorporation of binders to the diets, various amounts of carrageenan were dissolved in 80°C water. Three gms carrageenan was found to be the maximum amount that could be dissolved in the amount of water that gives 100 g of dry ingredients, the consistency necessary to extrude the pellets. After the binder was added to the dry ingredients, the sticky dough was extruded through a garlic press, unsteamed or steamed and dried to constant weight in an oven. Pellets were cut into ½ cm sizes. Five gms samples from each treatment were weighed, placed in wire baskets suspended on 50 ml beakers in 5 liters of aerated seawater. After 3, 6, 12 and 24 hours duplicate wire baskets were removed and dried to constant weight.

Water stability after 3, 6, 9, 12 and 24 hours are shown in Table 2 and Figure 1. A linear correlation was established between length of time of soaking and type of binder used. EPT-2 carrageenan was the best binder for both steamed and unsteamed pellets.

Carrageenan has been found to be a potential source and is used as binder in some food such as ice cream, and its other uses are presently being explored. Several types were supplied by the University of the Philippines, Marine Science Center. A more water stable pellet might be obtained if pelletized with more pressure than just a hand manipulated garlic press. Some of the binders so far found should be tried with heavy duty equipment. Under laboratory conditions only a few binders may be found useful. However, under commercial processing many more binders may suffice.

Table 1. Composition of experimental diets for water stability test

INGREDIENT	DIET (%)				
	A	B	C	D	E
Fish meal (local)	30	30	30	30	30
Shrimp head meal	15	15	15	15	15
Soybean meal	15	15	15	15	15
Rice bran	15	15	15	15	15
Bread flour	15	17	15	17	17
Sago palm starch	5	–	–	–	–
Carrageenan (EPT-2)	–	3	–	–	–
Gum arabic	–	–	5	–	–
Carrageenan (ST-0008-29)	–	–	–	3	–
Carrageenan (ST-0008-30A)	–	–	–	–	3
Corn oil	4	4	4	4	4
V 22 (Vit-Mix)	0.95	0.95	0.95	0.95	0.95
Vitamin C	0.05	0.05	0.05	0.05	0.05

Water requirement – 60 ml/100 grams diet

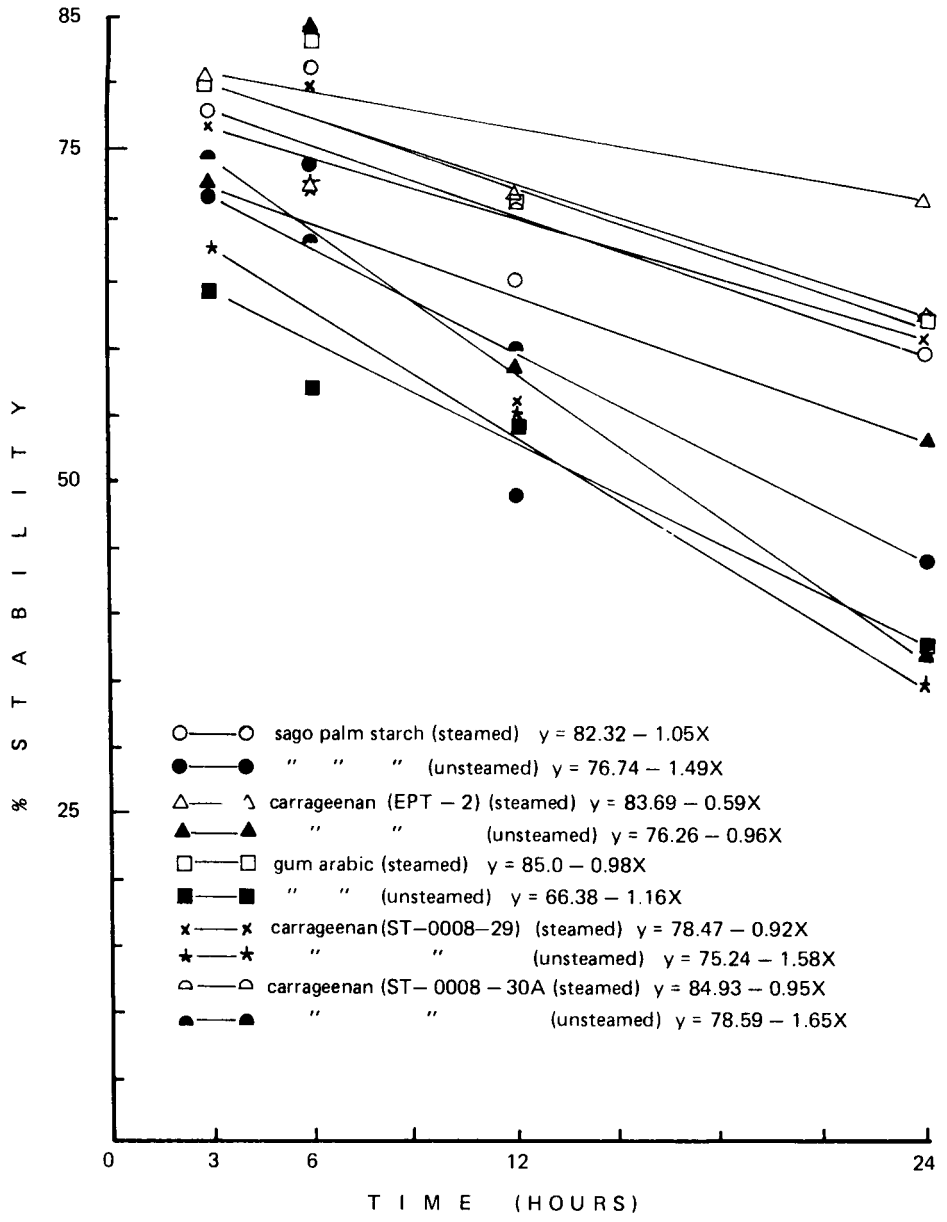

Fig. 1 The estimated linear regression based on the data collected from stability test performed on sago palm starch, gum arabic and different types of carageenan.

Table 2. Stability (%)* after 3, 6, 9, 12 and 24 hours.

Treatment No.	Binders	NO. OF HOURS OF SOAKING							
		3		6		12		24	
		Steamed	Unsteamed	Steamed	Unsteamed	Steamed	Unsteamed	Steamed	Unsteamed
A	Sago palm starch	77.59	72.56	81.01	73.97	65.0	49.13	58.45	44.24
B	Carrageenan(EPT-2)	80.64	72.25	84.76	72.46	71.88	63.75	70.92	53.36
D	Gum arabic	79.85	64.55	83.3	57.12	70.89	54.0	61.85	37.63
E	Carrageenan(ST-0008-29)	76.77	67.37	79.49	72.51	55.82	55.48	60.4	34.50
F	Carrageenan (ST-0008-30)	80.11	74.56	83.26	68.18	70.98	59.9	62.62	37.46

* $\frac{\text{Final Wt}}{\text{Initial Wt}} \times 100 = \%\ \text{Stability}$

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